

# The HCN domain couples voltage gating and cAMP response in hyperpolarization-activated cyclic nucleotide-gated channels

**Saponaro, Andrea**, University of Milan

**Gasparri, Federica**, University of Milan

**Bauer, Daniel**, Technical University of Darmstadt

**Gross, Christine**, Technical University of Darmstadt

**Pisoni, Matteo**, University of Milan

**Abbandonato, Gerardo**, University of Milan

**Hamacher, Kay**, Technical University of Darmstadt

**Santoro, Bina**, Columbia University

**Moroni, Anna**, University of Milan

**Porro, Alessandro**, University of Milan

**Thiel, Gerhard**, Technical University of Darmstadt

**anna.moroni@unimi.it**

Publication date: April 7, 2020

Publisher: Dryad

<https://doi.org/10.5061/dryad.rn85375>

---

## Citation

Saponaro, Andrea et al. (2020), The HCN domain couples voltage gating and cAMP response in hyperpolarization-activated cyclic nucleotide-gated channels, v6, Dataset,

<https://doi.org/10.5061/dryad.rn85375>

---

## Abstract

Hyperpolarization-activated cyclic nucleotide-gated (HCN) channels control spontaneous electrical activity in heart and brain. Binding of cAMP to the cyclic nucleotide-binding domain

(CNBD) facilitates channel opening by relieving a tonic inhibition exerted by the CNBD. Despite high resolution structures of the HCN1 channel in the cAMP bound and unbound states, the structural mechanism coupling ligand binding to channel gating is unknown. Here we show that the recently identified helical HCN-domain (HCND) mechanically couples the CNBD and channel voltage sensing domain (VSD), possibly acting as a sliding crank that converts the planar rotational movement of the CNBD into a rotational upward displacement of the VSD. This mode of operation and its impact on channel gating are confirmed by computational and experimental data showing that disruption of critical contacts between the three domains affects cAMP- and voltage-dependent gating in three HCN isoforms.

## Usage Notes

### Additional Information

Provided external link to software package in all three files. Please follow license terms when using code.

## References

This dataset is supplement to <https://doi.org/10.7554/eLife.49672>

## Keywords

Hyperpolarization-activated cyclic nucleotide-gated (HCN)

## Files

3 files for this dataset

LRT_Elbow.R_(1).txt	815 B	text/plain
LRT_HCND.R.txt	817 B	text/plain
LRT_S4.R.txt	815 B	text/plain

## License

This work is licensed under a [CC0 1.0 Universal \(CC0 1.0\) Public Domain Dedication](https://creativecommons.org/licenses/by/4.0/) license.



This releases your work to the public domain for any use.

